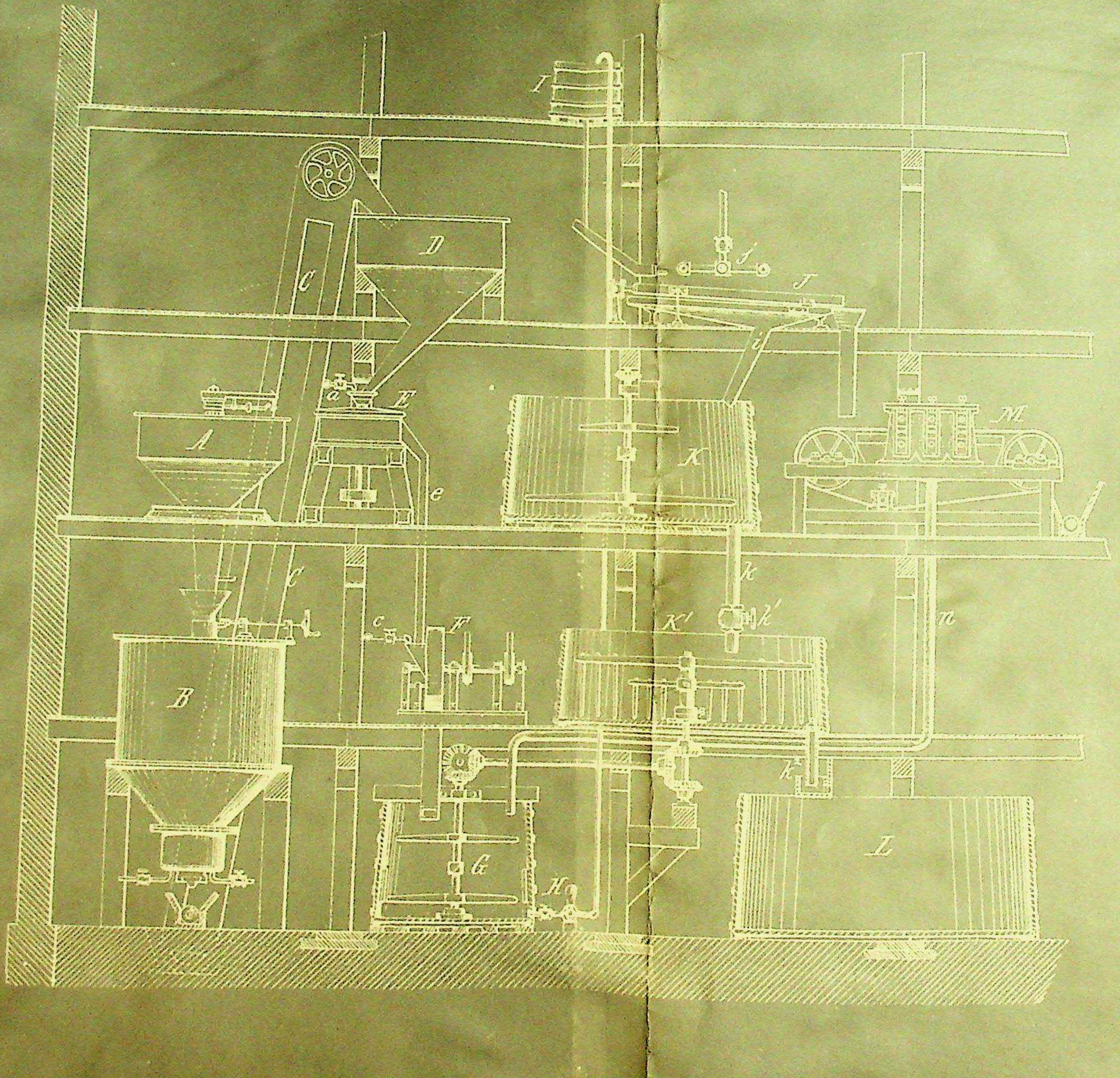
A.D. 1881, June 28 No. 2840.
LAKE'S Specification.



London: Printed by George Edward Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty. 1881.

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A.D. 1881, 28th *June.* N° 2840.

Treatment of Grain for Manufacture of Distilled Liquors or Spirits.

LETTERS PATENT to William Robert Lake, of the Firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for an Invention of "IMPROVEMENTS IN THE TREATMENT OF GRAIN FOR THE MANUFACTURE OF DISTILLED LIQUORS OR SPIRITS." A communication from abroad by Thomas Arnold Jebb and William Thomas Jebb, both of Buffalo, New York, United States of America.

PROVISIONAL SPECIFICATION left by the said William Robert Lake at the Office of the Commissioners of Patents on the 28th June 1881.

WILLIAM ROBERT LAKE, of the Firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London. "IMPROVEMENTS IN THE TREATMENT OF GRAIN FOR THE MANUFACTURE OF DISTILLED LIQUORS OR SPIRITS." [A communication from abroad by Thomas Arnold Jebb and William Thomas Jebb, both of Buffalo, New York, United States of America.]

This Invention relates to improvements in the method or manner of producing distilled spirits from grain, more especially from Indian corn or maize. Heretofore it has been the general practice to crush or grind the grain, and to mash, ferment, and distil all the constituent parts of the crushed or ground grain together, whereby a large amount of impurities or deleterious substances is liberated and mixed with the spirits, from which these substances are afterwards removed to a certain extent by rectification, while a great portion of the more volatile deleterious substances, such as fusel oil, remains in the rectified spirits, and has to be gradually eliminated by the slow process of "aging." In this manner of treating grain for the purpose of distillation the bran and gluten are discharged from the still in the form of slops, which contain such an excessive quantity of water that they are not desirable as feed and cannot be kept for even short periods of time without sowing, in consequence of which these slops have no commercial value in warm weather,

[*Price 6d.*]

and are in many localities treated as a waste product and permitted to run off, to the great detriment of localities through which run the water courses receiving this offal.

The objects of this Invention are to prevent the liberation of the deleterious substances which are contained in the bran and gluten, and the contamination of the spirits therewith; to preserve the bran and gluten in a form in which they can be advantageously utilized as feed; and to expedite the whole process of manufacture.

According to this Invention I effect a separation of the bran and gluten from the starchy constituent parts of the reduced grain, and wash, ferment, and distil the latter parts alone, while the bran and gluten are kept separate and disposed of as feed or otherwise as may be desirable. I also introduce glucose into the mash instead of malt, or reduced small grains, such as oats or barley, as now practised.

In carrying the said Invention into practice, the grain to be worked up is weighed, and then passes to a steep tub arranged below the weigh hopper.

The grain is steeped in this tub for a sufficient length of time to thoroughly soften the grain, but without causing fermentation to set in. The steep water is preferably maintained at a temperature of from 120° to 130° Fahrenheit.

The grain after it has reached the desired state of softness, and after the water has been drained off, is carried by an elevator to a receiver in the upper part of the building and is shot into a grinding mill, by which the grain is ground high, so as to reduce the bran and gluten to coarse fragments, while the starch is reduced more finely. A stream of water is directed into the eye of the runner by a pipe, and the product of grinding together with the water, escapes from the mill through a discharge spout, the ground grain goes from the discharge spout to a disintegrator in which such portions of the starchy matter as may still adhere to the fragments of bran and gluten are completely detached from these fragments.

A disintegrating machine provided with several concentric rows of pins or beaters revolving in opposite directions is preferably employed. An additional supply of water from a pipe may be mixed with the material as it enters the disintegrator if necessary. A washing or mixing tub arranged below the disintegrator receives the ground and beaten grain from the disintegrator. The tub is provided with rotating stirrers whereby a thorough mixing and washing of the grain is effected, and whereby all the starch becomes suspended in the water with which this tub is charged. The liquid material is taken from the washing tub by a pump, and elevated to a receiver in the upper part of the building. A shaking sieve arranged below the said receiver receives the liquid material from the latter, and effects, by the aid of fine streams of water which are delivered upon the sieve by suitable pipes, a separation of the starch from the bran and gluten, the latter passing over the tail end of the sieve, while the starch is washed through the perforations of the sieve and collected in a hopper or trough underneath the sieve. A tub or vat receives the water and starch from the trough, which is provided with a discharge pipe having a suitable gate or valve. The liquid is drawn into a mash tub from the receiver when a sufficient quantity has accumulated. The mash tub is of any ordinary and well known construction, and preferably provided with stirrers revolving in opposite directions. The starchy liquid is first washed at a temperature of about 180° Fahrenheit, then cooled down to about 160° Fahrenheit, when a quantity of glucose, either in the form of blocks or in granulated or liquid form, is added to the mash in about the proportion of twenty pounds of glucose for every bushel of malt which is added at this stage of the mashing process as it is now practised. The mash is then cooled to about 150° Fahrenheit, when an additional quantity of glucose may be added to the mash in about the same proportion in which crushed malt or small grains are now sometimes added to the mash at this stage of the process.

When the operation of mashing is completed, the mash is conducted by troughs or pipes to the fermenting tub or tubs in which the yeast is added, if it has not been introduced into the mash in the mash tub.

When the fermentation is complete the beer is charged into the still, and the spirits are distilled off in a well known manner.

The bran and gluten which are discharged by the sifting apparatus are conducted to a squeezing apparatus in which the wet offal is passed between one or more pairs of rollers, whereby the moisture is pressed out and the offal discharged in a comparatively dry condition, in which it can be preserved sweet for a considerable period of time, and transported over long distances. This starchy liquid which is pressed out of the offal is preferably conducted by a pipe to the washing tub, if this tub is used, or to the mash tub, if the washing tub is dispensed with. Although I prefer to use the washing tub, its employment is not absolutely essential, and it may be dispensed with, and the reduced grain be directly conducted to the sifting apparatus from the disintegrator.

It will be seen from the foregoing description that in this improved process the bran and gluten are separated from the starch before the operation of mashing is begun, and never afterwards again brought in contact with the substance which is fermented and distilled, whereby the following important advantages are gained:—The liberation of fusel oil and similar deleterious substances which results mainly from the presence of the bran and gluten in the mashed, fermented, or distilled material is avoided, and the spirits are produced free from these deleterious substances. The bulk of the material which is mashed, fermented, and distilled is greatly reduced by the exclusion of the bran and gluten from these steps in the process; the apparatus employed for mashing, fermenting, and distilling is proportionally reduced in size; the operation of distilling can be carried on less violently or with lower steam pressure, as the alcohol will more readily pass into the condensing worm, and the danger of carrying impurities mechanically over with the alcoholic vapor is correspondingly reduced; the costly rectifying apparatus is relieved of a large amount of its work, and can be much reduced in size and capacity, and the spirits will be of better quality and be fit for consumption in much less time than heretofore. The bran and gluten are preserved in a dry condition in which they can be advantageously disposed of as feed, and the annoyances and drawbacks attending the production of a large amount of unsaleable wet offal are thereby avoided.

By the employment of glucose instead of malt or small grains in mashings, the introduction of bran and gluten into the mash is avoided, and the operation of mashing is expedited and cheapened.

SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said William Robert Lake in the Great Seal Patent Office on the 20th December 1881.

William Robert Lake, of the Firm of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London. "IMPROVEMENTS IN THE TREATMENT OF GRAIN FOR THE MANUFACTURE OF DISTILLED LIQUORS OR SPIRITS." A communication from abroad by Thomas Arnold Jebb and William Thomas Jebb, both of Buffalo, New York, United States of America.

This Invention relates to improvements in the method or manner of producing distilled spirits from grain, more especially from Indian-corn or maize. Heretofore it has been the general practice to crush or grind the grain, and to mash, ferment, and distil all the constituent parts of the crushed or ground grain together, whereby a large amount of impurities or deleterious substances is liberated and mixed with the spirits, from which these substances are afterwards removed to a certain extent by rectification, while a great portion of the more volatile deleterious substances, such as fusel oil, remains in the rectified spirits, and has to be gradually eliminated by the slow process of aging. In this manner of treating grain for the purpose of distillation, the bran and gluten are discharged from the still in the form of slops which contain such an excessive quantity of water that they are not desirable as feed, and cannot be kept for even short periods of time without souring, in consequence of which these slops have no commercial value in warm weather, and are in many localities treated as a waste product and permitted to run off, to the great detriment of localities through which run the water courses receiving this offal.

The objects of this Invention are to prevent the liberation of the deleterious substances which are contained in the bran and gluten, and the contamination of the spirits therewith, to preserve the bran and gluten in a form in which they can be advantageously utilized as feed, and to expedite the whole process of manufacture.

The said Invention consists to these ends in effecting a separation of the bran and gluten from the starchy constituent parts of the reduced grain, and in mashing, fermenting, and distilling the said parts alone while the bran and gluten are kept separate and disposed of as feed or otherwise as may be desirable, and it also consists in the process of manufacture as a whole, as hereinafter fully set forth.

The accompanying Drawing represents a sectional elevation of the apparatus or plant employed in manufacturing spirits according to the said improved process.

A represents the hopper in which the grain to be worked up is weighed and from which it passes to a steep tub B arranged below the said hopper. The steep tub B is preferably constructed of iron in the manner described and shown in the Specification of former Letters Patent, dated January 28, 1881, No. 386. The grain is steeped in this tub for a sufficient length of time to thoroughly soften the grain but without causing fermentation to set in. The steep water is preferably maintained at a temperature of from 120° to 130° Fahrenheit.

C represents an elevator which receives the grain from the steep tub B after it has reached the desired state of softness and after the water has been drained off. The said elevator C carries the grain to a receiver D in the upper part of the building. E represents a grinding mill, into which the grain is run from the receiver D and by which the grain is ground in such a manner as to reduce the bran and gluten to coarse fragments while the starch is reduced more finely. A stream of water is directed into the eye of the runner by a pipe *a*, and the product of grinding together with the water escapes from the mill through the discharge spout *e*. F represents a disintegrator which receives the ground grain from the discharge spout *e* of the mill E, and in which such portions of the starchy matter as may still adhere to the fragments of bran and gluten are completely detached from these fragments. A disintegrating machine provided with several concentric rows of pins or beaters revolving in opposite directions is preferably employed. An additional supply of water from a pipe *c* may be mixed with the material as it enters the disintegrator if necessary.

G represents a washing or mixing tub arranged below the disintegrator F to receive the ground and beaten grain from the said disintegrator. The tub G is provided with rotating stirrers, whereby a thorough mixing and washing of the grain is effected, and whereby all the starch becomes suspended in the water with which this tub is charged; H represents a pump, by which the liquid material is taken from the washing tub by a pump, and elevated to a receiver I in the upper part of the building; J represents a shaking sieve arranged below the said receiver to receive the liquid material from the latter. The said sieve J effects by the aid of fine streams of water which are delivered upon the sieve by suitable pipes *j* a separation of the starch from the bran and gluten, the latter passing over the tail end of the sieve, while the starch is washed through the perforations of the sieve and collected in a hopper or trough *i* underneath the same; K represents a tub or vat which receives the water and starch from the trough *i* beneath the sieve, and which is provided with a discharge pipe *k* having a suitable gate or valve k^1; k^1 represents the mash-tub, into which the liquid is drawn from the receiver K when a sufficient quantity has accumulated. The mash-tub is of any ordinary and well known construction, and preferably provided with stirrers revolving in opposite directions. The starchy liquid is first mashed at a temperature of about 180° Fahrenheit, then cooled down to about 160° Fahrenheit, when a quantity of glucose, either in the form of blocks or in a granulated or liquid form, is added to the mash in about the proportion of twenty pounds of glucose for every bushel of malt, which is added at this stage of the mashing process as it is now practised. The mash is then cooled to about 150° Fahrenheit, when an additional quantity of glucose may be added to the mash in about the same proportion in which crushed malt or small grains are now sometimes added to the mash at this stage of the process.

When the operation of mashing is completed, the mash is conducted by the troughs or pipes k^2 to the fermenting tub or tubs L, in which the yeast is added if it has not been introduced into the mash in the mash-tub. When the fermentation is complete the beer is charged into a still, and the spirits are distilled off in a well known manner.

The bran and gluten which are discharged by the sifting apparatus J are conducted to a squeezing apparatus M, in which the wet offal is passed between one or more pairs of rollers, whereby the moisture is pressed out and the offal discharged in a comparatively dry condition, in which state it can be preserved sweet for a considerable period of time, and transported over long distances. The starchy liquid which is pressed out of the offal is preferably conducted by a pipe *n* to the washing tub G if this tub is used, or to the mash-tub K^1 if the tub G is dispensed with. Although I prefer to use the washing tub G, its employment is not absolutely essential, and it may be dispensed with, and the reduced grain be directly conducted to the sifting apparatus J from the disintegrator F.

It will be seen from the foregoing description that in this improved process the bran and gluten are separated from the starch before the operation of mashing is begun, and never afterwards again brought in contact with the substance which is fermented and distilled, whereby the following important advantages are gained:—The liberation of fusel oil and similar deleterious substances which results mainly from the presence of the bran and gluten in the mashed, fermented, or distilled material is avoided, and the spirits are produced free from these deleterious substances; the bulk of the material which is mashed, fermented, and distilled is greatly reduced by the exclusion of the bran and gluten from these steps in the process; the apparatus employed for mashing, fermenting, and distilling is proportionally reduced in size; the operation of distilling can be carried on less violently or with lower steam pressure, as the alcohol will more readily pass over into the condensing worm, and the danger of carrying impurities mechanically over with the alcoholic vapor is correspondingly reduced; the costly rectifying apparatus is relieved of a large amount of its work, and can be much reduced in size and capacity, and the spirits will be of better quality and be fit for consumption in much less time than heretofore. The bran and gluten are preserved in a dry condition, in which state they can be advantageously disposed of as feed, and the annoyances and drawbacks attending on the production of a large amount of unsaleable wet offal are thereby avoided.

By the employment of glucose instead of malt or small grains in mashing, the introduction of bran and gluten into the mash is avoided, and the operation of mashing is expedited and cheapened.

Having thus fully described the said Invention as communicated to me by my foreign correspondents, and the manner of performing the same, I wish it understood that I claim,—

First. In the manufacture of distilled spirits from grain, the method of separating the bran and gluten from the starch contained in the reduced grain, and then mashing, fermenting, and distilling the separated starch alone, whereby purer spirits are produced, and the bran and gluten are preserved in a more useful condition, substantially as above set forth.

Second. The herein described process of manufacturing distilled spirits from grain, which process consists in first steeping the grain, then reducing the steeped grain by grinding or beating, then separating the bran and gluten from the starchy liquid by sifting, and then mashing, fermenting, and distilling the separated starch alone, substantially as above set forth.

In witness whereof, I, the said William Robert Lake, have hereunto set my hand and seal, this Twentieth day of December, in the year of our Lord One thousand eight hundred and eighty one.

W^M^. ROB^T^. LAKE. (L.S.)

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LONDON: Printed by George Edward Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

1881.